

REMARKS

In the Office Action, claims 1-27 are pending. Claims 1, 13, 14, 21, and 24-27 were rejected under 35 U.S.C. § 102(b) as being anticipated by Pflugrath et al., (U.S. Patent 5,722,412, hereinafter “Pflugrath”). Claims 1, 13, 14, 21, and 24-27 were also rejected under 35 U.S.C. § 102(b) as being anticipated by Okazaki et al., (U.S. Patent 5,524,625, hereinafter “Okazaki”). Claims 4, 5 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little et al., (U.S. Patent 5,893,363, hereinafter “Little”). Claims 4, 5 and 8 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Okazaki in view of Little et al. Claims 6 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little. Claims 22 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Chiang et al., (U.S. Patent 5,590,658, hereinafter “Chiang”). Claim 23 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Okazaki in view of Chiang.

By the present Response, independent claims 1, 21 and 26 have been amended. These amendments do not add any new matter. Upon entry of the amendments, claims 1-27 will be pending in the present patent application. Reconsideration and allowance of all pending claims are requested.

Examiner’s response to arguments

In the “Response to Arguments” section of the Office Action, the Examiner stated that Applicants’ arguments filed on January 7, 2008 has been fully considered but they are not persuasive. The Examiner further referred to FIG. 6, elements 302-306 of Pflugrath and stated they show four different pulsers attached to four different transducer elements. The Examiner further referred to the newly cited reference of Okazaki and mentioned that Okazaki teaches multiple

pulsers attached to multiple transducer elements. In view of these comments and the newly cited reference of Okazaki, Applicants respectfully traverse these rejections.

Rejections Under 35 U.S.C. §102

Claims 1, 13, 14, 21, and 24-27 were rejected under 35 U.S.C. § 102(b) as being anticipated by Pflugrath. Claims 1, 13, 14, 21, and 24-27 were also rejected under 35 U.S.C. § 102(b) as being anticipated by Okazaki. Claims 1, 13, 14, 21, and 24-27 are believed to be patentable as discussed below.

Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. Applicants respectfully assert that the present invention, as recited in independent claims 1, 13, 21 and 26, is patentable over Pflugrath. Applicants respectfully assert that the present invention, as recited in independent claims 1, 13, 21 and 26, is also patentable over Okazaki.

Independent claims 1, 13, 21 and 26 and their dependents

Independent claim 1, as amended, recites, *inter alia*, a probe that includes a plurality of reconfigurable pulsers within said probe responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer, *wherein said probe further includes a multiplexer that receives said timing signals from said external system and provides said signals to said plurality of transducers*. Claim 13 recites *inter alia*, a probe that includes a plurality of transducers and *a low voltage multiplexer responsive to a control signal from an external system and configured to distribute signals to said array of reconfigurable pulsers*. Similarly, claim 21, as amended recites, *inter alia*, a method for operating a transducer probe. The method includes *sending said one*

or more signals from said external source to a multiplexer included in said probe; providing said one or more signals from said multiplexer to a plurality of transducers. In a similar manner, claim 26, as amended recites, *inter alia*, a method for operating a transducer probe. The method includes *sending said one or more signals from said external source to a multiplexer included in said probe; providing said one or more signals from said multiplexer to a plurality of transducers.*

Pflugrath fails to teach that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers.

In the “Claim Rejections” section, on page 2 of the Final Office Action, the Examiner suggested that Pflugrath is believed to teach plurality of pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to a plurality of transducers, and referred to FIG. 5 and the elements ASIC 20, ASIC 30 and ASIC 50. Applicants refer to the relevant details of the elements ASIC 20, ASIC 30 and ASIC 50 as described in col. 2, line 59 – col. 3, line 5 of Pflugrath. The cited passage reads:

The transmit/receive ASIC is preferably located within inches of the transducer elements, preferably in the same enclosure, and just behind the transducer.

Echoes received by the transmit/receive ASIC 20 are provided to the adjacent front end ASIC 30, which beamforms the echoes from the individual transducer elements into scanline signals. The front end ASIC 30 also controls the transmit waveform, timing, aperture and focusing. In the illustrated embodiment the front end ASIC 30 provides timing signals for the other ASICs, time gain control, and monitors and controls the power applied to the transducer array, thereby controlling the acoustic energy which is applied to the patient and minimizing power consumption of the unit. A memory device 32 is connected to the front end ASIC 30, which stores data used by the beamformer.

In describing ASIC 30, it is mentioned that front end ASIC 30 controls the transmit waveform, timing, aperture and focusing. Moreover, the front end ASIC 30 provides timing signals for the other ASICs, time gain control, and monitors and controls the power applied to the transducer array, thereby controlling the acoustic energy which is applied to the patient and minimizing power consumption of the unit. However, nowhere does Pflugrath teach *that the probe includes a multiplexer that receives timing signals from an external system and provide the signals to a plurality of transducers.* Indeed, one skilled in the art would clearly understand that ASIC 30 provides *timing signals to the pulsers.* Pflugrath, at the very least, never indicates that *a multiplexer can be included in a probe to receive timing signals from an external system and to provide signals to a plurality of transducers.*

Applicants' amended claims, on the other hand, require that the probe includes a multiplexer that receives the timing signals from the external system and provides the signals to the plurality of transducers. Lines 1-7 of paragraph 6 of the Applicants' disclosure elaborates this further:

Still other configurations of the present invention provide a probe that includes a plurality of transducers. The probe also includes an array of pulsers, wherein each transducer element is responsive to pulses from a dedicated pulser. *The probe also contains a low voltage multiplexer that is responsive to a control signal from an external system and which is configured to distribute signals to the array of pulsers. The pulsers are responsive to the signals from the multiplexer to generate pulses to the transducers.* (Emphasis added.)

In summary, Applicants respectfully submit that Pflugrath cannot support a *prima facie* case of anticipation of independent claims 1, 13, 21 and 26. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw the rejection of these claims under 35 U.S.C. 102(b).

Okazaki fails to teach that the probe includes a multiplexer that receives said timing signals from an external system and provides the signals to a plurality of transducers.

In the “Claim Rejections” section, on page 3 of the current Final Office Action, the Examiner suggested that Okazaki is believed to teach method and apparatus for generating one or more signals in an external system; controlling a plurality of reconfigurable pulsers in a probe utilizing the one or more signals from the external system; and operating a plurality of transducers utilizing signals from the plurality of reconfigurable pulsers , wherein each reconfigurable pulser is coupled to a respective transducer and referred to the Abstract and FIGS. 7 and 10.

The cited Abstract of Okazaki reads:

In a shock wave generating system, a width of a focused region synthesized from a plurality of focal points formed by a plurality of shock waves is varied by properly controlling delay times and/or drive voltages for a plurality of ring-shaped piezoelectric transducer elements. The shock wave generating system includes a shock wave generating unit having a plurality of shock-wave generating elements and a driving unit for separately driving the plurality of shock-wave generating elements by controlling at least delay times to produce a plurality of shock waves in such a manner that a dimension of a focused region synthesized from a plurality of different focal points formed by the plurality of shock waves, is varied in accordance with a dimension of a concretion to be disintegrated which is present in a biological body under medical examination.

In describing the driving unit 6 in FIG. 4, it is mentioned that the driving unit 6 may provide the timing signals for the pulsers in the probe. The same teaching is also evident from FIG. 7 and its description, wherein the delay circuits 11, producing timing signals for the pulsers, are shown in the driving unit 6. However, nowhere does Okazaki teach that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers. Indeed, one skilled in the art would clearly understand that

the driving unit 6 in FIG. 4 may be located external to the probe. Okazaki, at the very least, never indicates that a multiplexer can be included in a probe to receive timing signals from an external system and to provide signals to a plurality of transducers.

In summary, Applicants respectfully submit that Okazaki cannot support a *prima facie* case of anticipation of independent claims 1, 13, 21 and 26. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw the rejection of these claims under 35 U.S.C. 102(b).

Rejections Under 35 U.S.C. § 103

The Office Action summarizes claims 4, 5 and 8 as rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little. Claims 4, 5 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Okazaki in view of Little. Claims 6 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little. Claims 22 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Chiang. Claim 23 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Okazaki in view of Chiang.

As discussed above with regards to 35 U.S.C. § 102(b) rejection above, each of the two primary references fails to teach that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers. This deficiency of Pflugrath and Okazaki is not overcome by the secondary references.

Neither Little nor Chiang teaches that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers.

First, Little fails to obviate the deficiencies in the teachings of Pflugrath and Okazaki. Specifically, Little fails to disclose that the probe includes a multiplexer that receives a timing signals from an external system and provides the signals to a plurality of transducers as claimed in independent claims 1, 13, 21 and 26.

In the “Claim Rejections” section, on page 4, lines 11-14 of the Office Action, the Examiner stated that Pflugrath does not teach specifically an ultrasound system with low voltage multiplexer and the Examiner relied on Little solely for the disclosure of ultrasound system, wherein multiplexers have inputs coupled to said low voltage inputs and outputs coupled to the transducer drivers. Further, on page 4, lines 13-15 of the Office Action, the Examiner stated that Pflugrath does not teach pulsers to be bipolar, unipolar or combination of both and a conversion to set the timing signal to operate with low voltage pulsers. The Examiner relied on Little solely for the disclosure of drive signals for unipolar pulsers (202) to each terminal of pulser as well as the complementary waveforms applied when bipolar signals are used. Again, on page 5, lines 7-10 of the Office Action, the Examiner stated that Pflugrath does not teach a digital to analog converter in handle, to transmit timing signals. The Examiner relied on Little solely for the disclosure of a digital-to-analog converter (338) used in handle to convert the transmit signals to analog format for the use of pulser.

In a similar manner, in the “Claim Rejections” section, on page 4, lines 17-20 of the Office Action, the Examiner stated that Okazaki does not teach an ultrasound system with low voltage multiplexer and the Examiner relied on Little

solely for the disclosure of ultrasound system, wherein multiplexers have inputs coupled to low voltage inputs and outputs coupled to the transducer drivers.

Little does not teach or disclose that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers. The system taught by Little relates to portable, configurable and scalable ultrasonic imaging system uses a phased ultrasonic transducer array coupled to a portable, configurable and scalable ultrasonic processor to develop ultrasonic images. In describing the portable, configurable and scalable ultrasonic imaging system, nowhere does Little teach or disclose *that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers.*

Chiang also fails to obviate the deficiencies in the teachings of Pflugrath and Okazaki. Specifically, Chiang fails to disclose an array of reconfigurable pulsers, and specifically each reconfigurable pulser being coupled to a respective transducer as claimed in independent claims 1, 13 and 21.

In the “Claim Rejections” section, on page 5, lines 16-21 of the Office Action, the Examiner stated that Pflugrath does not teach specifically signals from the external system to comprise timing signals. The Examiner relied on Chiang solely for the disclosure of pulsers (22-1-n) to synchronize the signal to be sent to transducer (18-1-n). Further, on page 6, lines 1-8 of the Office Action, the Examiner stated that Pflugrath does not teach a plurality of transducers utilizing signals from the plurality of pulsers. The Examiner relied on Chiang solely for the disclosure of every individual transducer (18-1-n) being in contact with the dedicated pulsers (22-1-n) through a high voltage driver.

In a similar manner, in the “Claim Rejections” section, on page 6, lines 11-18 of the Office Action, the Examiner stated that Okazaki does not teach a plurality of transducers utilizing signals from the plurality of pulsers. The Examiner relied on Chiang solely for the disclosure of every individual transducer (18-1-n) being in contact with the dedicated pulsers (22-1-n) through a high voltage driver.

Chiang does not teach or disclose that the probe includes a multiplexer that operates as claimed. In describing the portable ultrasound imaging system, nowhere does Chiang teach or disclose *that the probe includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers.*

In summary, none of the art of record teaches, suggests or discloses a probe that includes a multiplexer that receives timing signals from an external system and provides the signals to a plurality of transducers as recited in independent claims 1, 13, 21 and 26. Consequently, the independent claims 1, 13, 21 and 26 and the dependent claims 4, 5, 6, 7, 8, 22 and 23 are allowable over the art.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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